The time of reappearance was recorded, at the 15-inch, one minute later than that given, which agrees with the computed time and with Mr. Lohse's observation.

Dun Echt Observatory:
1885, *April* 6.

Occultations of Stars by the Moon in the years 1876–1880, *and resulting Final Equations between the Errors of the Tables and the Errors of Observation.* By G. L. Tupman.

The place of observation was a few hundred yards east of the Royal Observatory, Greenwich. The chronometer employed (Fletcher 1050) was compared, by the intervention of another, with the sidereal standard clock of the Royal Observatory, a few hours before and after every recorded occultation. The Greenwich mean times have been calculated in the usual way from the sidereal time at mean noon given in the *Nautical Almanac*.

The telescope generally used was an Equatorial of $4\frac{1}{2}$ inches aperture, furnished with position circle and crossed-bar micrometer with power 66. For observing emersions one of the bars was placed to cut off a small segment of the Moon's limb at the expected point of reappearance of the star.

The final equations between the errors of Hansen's Tables and the errors of observation have been calculated by the method employed at the Royal Observatory, described in the Introduction to the *Greenwich Observations* and in Main's *Spherical Astronomy*.

The observed time is supposed to be increased by t^s; the star's Right Ascension and North Polar Distance by e'' and f'' (seconds of arc); the Moon's R.A. and N.P.D. by x'' and y''; and the parallax and semidiameter are supposed to be multiplied by $\left(1+\frac{m}{1000}\right)$ and $\left(1+\frac{n}{1000}\right)$ respectively.

The Moon's Right Ascension and North Polar Distance were interpolated, with second differences, from the hourly ephemeris in the *Nautical Almanac*, which did not, in these years, include Professor Newcomb's correction. The Equatorial horizontal parallax and semidiameter were interpolated, also with second differences, from the same work.

The apparent places of the stars have been taken, generally, from the section "Elements of Occultations" in the *Nautical Almanac*. For the smaller stars the mean places were brought up from the catalogues indicated, and the reductions to apparent place computed by means of the "Independent Constants." The final equations have been computed for such stars because it is probable, from the brightness of the stars, that modern observations of them will, before long, be obtainable.

In the calculation of the geocentric place of the "Corresponding Point" on the Moon's limb, the place of observation (except for the first one) has been assumed to be in

	h	m	s	
Longitude	0	0	2·62	East of the Royal Observatory.

	°	′	″	
Astronomical Latitude	51	28	34·8	N.
Geocentric Latitude...	51	17	21·2	

which latitude was obtained by triangulation from the Royal Observatory. Thirteen pairs of stars observed by Talcott's method in 1880 with the Zenith Telescope belonging to the Society gave the mean result:

$$51^\circ\ 28'\ 35''{\cdot}8 \pm 0''{\cdot}4.$$

1876, *April* 7.—Disappearance of BAC 4225 at the Moon's bright limb,* observed from the South Ground of the Royal Observatory with detached telescope; wind troublesome; star faint; near Moon's south limb:

	h	m	s	
Greenwich Mean Solar Time	8	27	52·0	
Star's App. R.A.	12	25	17·78.	N.P.D. 94° 22′ 19″·6 (N.A.)

Final Equation ... ... $+1''{\cdot}02 = -{\cdot}1088\,(e''-x'') - {\cdot}2280t + {\cdot}9940f'' - 2{\cdot}5919m - {\cdot}9940y'' - {\cdot}9305n$

1877, *February* 26.—Disappearance of *α Leonis* at the dark limb:

	h	m	s	
G.M.T.	12	45	44·67	
Star's App. R.A.	10	1	51·51.	N.P.D. 77° 26′ 4″·1 (N.A.)

Final Equation ... ... $+11''{\cdot}53 = +{\cdot}8498\,(e''-x'') - {\cdot}4987t + {\cdot}4884f'' - 0{\cdot}5132m - {\cdot}4876y'' - {\cdot}9988n$

1877, *February* 26.—Reappearance of *α Leonis* at the bright limb:

	h	m	s	
G.M.T.	13	51	8·46.	"Late."

Final Equation ... ... $-10''{\cdot}43 = -{\cdot}7518\,(e-x) + {\cdot}5193t - {\cdot}6349f + 0{\cdot}5099m + {\cdot}6355y - {\cdot}9987n$

* Because nearly full.

1878, *May* 5.—Disappearance of Yarnall 2332 at the dark limb:

	h m s	
G.M.T.	8 16 26·09	
Star's App. R.A.	5 31 21·92.	N.P.D. 63° 27′ 9″·1 (Yarnall)
Final Equation	$+17''\cdot34 =$	$+\cdot6193\,(e-x) - \cdot4210t$
		$+\cdot7182f \quad -0\cdot1743m$
		$-\cdot7170y \quad -\cdot9282n$

1878, *May* 5.—Disappearance of Yarnall 2355 at the dark limb:

	h m s	
G.M.T.	9 15 14·92	
Star's App. R.A.	5 34 1·51.	N.P.D. 63° 26′ 51″·9 (Yarnall)
Final Equation	$+19''\cdot00 =$	$-\cdot5033\,(e-x) - \cdot5450t$
		$+\cdot4284f \quad +0\cdot8071m$
		$-\cdot4266y \quad -\cdot9285n$

1878, *November* 10.—Disappearance of η *Tauri* at the bright limb:

	h m s	
G.M.T.	11 11 5·05.	"Very good."
Star's App. R.A.	3 40 19·27.	N.P.D. 66° 16′ 3″·9 (N.A.)
Final Equation	$+4''\cdot26 =$	$+\cdot7593\,(e-x) - \cdot2335t$
		$+\cdot5546f \quad -1\cdot3713m$
		$-\cdot5532y \quad -\cdot8976n$

1878, *November* 10.—Reappearance of 20 *Tauri* at the dark limb: 21^h after full moon:

	h m s	
G.M.T.	11 21 46·05.	"Pretty good."
Star's App. R.A.	3 38 39·37.	N.P.D. 66° 0′ 32″·5 (N.A.)
Final Equation	$-7''\cdot26 =$	$-\cdot8414\,(e-x) + \cdot2856t$
		$-\cdot3819f \quad +1\cdot0508m$
		$+\cdot3835y \quad -\cdot8977n$

1879, *March* 2.—Disappearance of 139 *Tauri* at the dark limb:

	h m s	
G.M.T.	4 52 39·32.	"Full daylight: star held steadily until extinguished."
Star's App. R.A.	5 50 31·40.	N.P.D. 64° 3′ 40″·2 (N.A.)
Final Equation	$+6''\cdot50 =$	$+\cdot8126\,(e-x) - \cdot3605t$
		$+\cdot4203f \quad -1\cdot7390m$
		$-\cdot4185y \quad -\cdot9149n$

1879, *March* 2.—Reappearance of 139 *Tauri* at the bright limb:

		h m s
G.M.T.		6 4 32·21. "Excellent."
Final Equation	$-5''\cdot16 =$	$-\cdot8172\,(e-x) + \cdot3430t$
		$+\cdot4105f \quad -0\cdot0665m$
		$-\cdot4087y \quad -\cdot9155n$

1879, *March* 3.—Disappearance of ω *Geminorum* at the dark limb:

		h m s
G.M.T.		9 18 46·84
Star's App. R.A.		6 55 4·88. N.P.D. 65° 36′ 46″·4 (N.A.)
Final Equation	$+4''\cdot89 =$	$+\cdot8364\,(e-x) - \cdot3146t$
		$-\cdot3911f \quad +1\cdot1977m$
		$+\cdot3929y \quad -\cdot9308n$

1879, *March* 3.—Reappearance of ω *Geminorum* at the bright limb:

		h m s
G.M.T.		10 16 16·43. "Star just clear."
Final Equations	$-5''\cdot81 =$	$-\cdot4865\,(e-x) + \cdot3290t$
		$-\cdot8442f \quad +0\cdot8112m$
		$+\cdot8448y \quad -\cdot9314n$

1879, *March* 30.—Disappearance of BAC 2154 at the dark limb:

		h m s
G.M.T.		7 16 4·13. "Near south limb."
Star's App. R.A.		6 30 4·54. N.P.D. 65° 18′ 36″·9 (N.A.)
Final Equation	$+1''\cdot26 =$	$+\cdot2145\,(e-x) - \cdot1766t$
		$+\cdot9717f \quad -1\cdot3374m$
		$-\cdot9715y \quad -\cdot9140n$

1879, *April* 26.—Disappearance of BB. VI.+24°, 1263 at the dark limb:

		h m s
G.M.T.		9 8 51·93
Star's App. R.A.		6 18 52·75. N.P.D. 65° 11′ 43″·3 (BB. VI.)
Final Equation	$+9''\cdot58 =$	$+\cdot9030\,(e-x) - \cdot4812t$
		$+\cdot0251f \quad +1\cdot9605m$
		$-\cdot0231y \quad -\cdot9044n$

1879, *May* 3.—Disappearance of *q Virginis* at the dark limb:

		h m s	
G.M.T.	9 19 33·17		
Star's App. R.A.	12 27 34·88.	N.P.D. 98° 47′ 24″·8 (N.A.)	
Final Equation	$+9''\cdot26 =$	$+\ 8997\ (e-x) -\ \cdot2546t$	
		$-\cdot4178f$	$+1\cdot1153m$
		$+\cdot4172y$	$-\ \cdot9953n$

1879, *July* 28.—Disappearance of *α Scorpii* at the dark limb:

		h m s	
G.M.T.	9 37 39·34.	"Almost instantaneous."	
Star's App. R.A.	16 22 3·45.	N.P.D. 116° 9′ 56″·6 (N.A.)	
Final Equation	$+5''\cdot58 =$	$+\cdot4055\ (e-x) -\ \cdot1756t$	
		$-\cdot8941f$	$+3\cdot4441m$
		$-\cdot8937y$	$-\ \cdot9726n$

1879, *July* 28.—Reappearance of *α Scorpii* at the bright limb:

		h m s	
G.M.T.	10 6 45·88.	"Instantaneous; near the north limb."	
Final Equation	$-2''\cdot43 =$	$-\cdot3258\ (e-x) +\ \cdot1840t$	
		$-\cdot9327f$	$+2\cdot6675m$
		$+\cdot9325y$	$-\ \cdot9725n$

1879, *August* 25.—Disappearance of Bradley 2174 at the dark limb:

		h m s	
G.M.T.	8 5 38·71		
Star's App. R.A.	17 6 45·92.	N.P.D. 116° 50′ 26″·3 (N.A.)	
Final Equation	$+15''\cdot23 =$	$+\cdot8596\ (e-x) -\ \cdot4192t$	
		$-\cdot2950f$	$+1\cdot6678m$
		$+\cdot2930y$	$-\ \cdot9644n$

1879, *October* 24.—Disappearance of *θ Aquarii* at the dark limb:

		h m s	
G.M.T.	7 12 38·28.	"Hardly instantaneous."	
Star's App. R.A.	22 10 31·00.	N.P.D. 98° 22′ 44″·5 (N.A.)	
Final Equation	$+12''\cdot04 =$	$+\cdot6310\ (e-x) -\ \cdot3773t$	
		$-\cdot7712f$	$+1\cdot9596m$
		$+\cdot7710y$	$-\ \cdot9179n$

1879, *November* 18.—Disappearance of σ *Capricorni* at the dark limb:

	h m s
G.M.T.	6 35 41·39
Star's App. R.A.	20 12 28·21. N.P.D. 109° 29′ 32″·7 (N.A.)

Final Equation ... .. $+11''\cdot12 = +\cdot9393\,(e-x) - \cdot4412t - \cdot1332f + 1\cdot6171m + \cdot1316y - \cdot9593n$

1879, *December* 22.—Disappearance of 101 *Piscium* at the dark limb:

	h m s
G.M.T.	5 6 58·20
Star's App. R.A.	1 29 22·92. N.P.D. 75° 56′ 58″·6 (N.A.)

Final Equation ... ... $+5''\cdot59 = +\cdot8608\,(e-x) - \cdot2178t + \cdot4569f - 1\cdot9730m + \cdot4561y - \cdot8911n$

1880, *January* 19.—Disappearance of BB. VI.+17°, 327 at the dark limb:

	h m s
G.M.T.	8 43 7·58
Star's App. R.A.	2 6 0·01. N.P.D. 72° 32′ 22″·0 (BB. VI.)

Final Equation ... ... $+5''\cdot08 = +\cdot8865\,(e-x) - \cdot2894t + \cdot3616f + 0\cdot4656m - \cdot3604y - \cdot8919n$

1880, *February* 12.—Disappearance of κ *Piscium* at the dark limb:

	h m s
G.M.T.	5 32 28·31
Star's App. R.A.	23 20 47·13. N.P.D. 89° 24′ 2″·4 (N.A.)

Final Equation ... ... $+10''\cdot14 = +\cdot4352\,(e-x) - \cdot3880t - \cdot9003f + 3\cdot1440m + \cdot9003y - \cdot9323n$

1880, *February* 17.—Disappearance of WB_2 III. 538 at the dark limb:

	h m s
G.M.T.	8 39 54·3
Star's App. R.A.	3 27 29·80. N.P.D. 67° 38′ 31″·2 (WB_2)

Final Equation ... ... $+8''\cdot93 = +\cdot8806\,(e-x) - \cdot3522t + \cdot2948f + 0\cdot8508m - \cdot2932y - \cdot8891n$

1880, *February* 17.—Disappearance of WB_2 III. 554 at the dark limb:

		h m s	
G.M.T.	9 18 37·3.	"Near north limb."	
Star's App. R.A.	3 27 53·51.	N.P.D. 67° 17′ 58″·1 (WB_2)	
Final Equation	$+2''{\cdot}65 =$	$+{\cdot}2733\,(e-x)$	$-{\cdot}1646t$
		$-{\cdot}9549f$	$+2{\cdot}2962m$
		$+{\cdot}9551y$	$-{\cdot}8890n$

1880, *February* 17.—Disappearance of BB. VI. +22°, 516 at the dark limb:

		h m s	
G.M.T.	9 48 50·3		
Star's App. R.A.	3 29 31·95.	N.P.D. 67° 28′ 15″·6 (BB. VI.)	
Final Equation	$+2''{\cdot}52 =$	$+{\cdot}9064\,(e-x)$	$-{\cdot}4200t$
		$-{\cdot}1707f$	$+2{\cdot}1069m$
		$+{\cdot}1725y$	$-{\cdot}8890n$

1880, *March* 13.—Disappearance of 101 *Piscium* at the dark limb:

		h m s	
G.M.T.	7 34 35·98		
Star's App. R.A.	1 29 22·03.	N.P.D. 75° 57′ 4″·3 (N.A.)	
Final Equation	$+6''{\cdot}89 =$	$+{\cdot}9612\,(e-x)$	$-{\cdot}4485t$
		$+{\cdot}1092f$	$+1{\cdot}7744m$
		$-{\cdot}1080y$	$-{\cdot}9047n$

1880, *March* 15.—Disappearance of DM+21°, 426 at the dark limb:

		h m s	
G.M.T.	6 43 42·39		
Star's App. R.A.	3 6 22·30.*	N.P.D. 68° 49′ 25″·0 (D.M.)	
Final Equation	$-15''{\cdot}08 =$	$+{\cdot}9270\,(e-x)$	$-{\cdot}3946t$
		$-{\cdot}0657f$	$+1{\cdot}6381m$
		$+{\cdot}0675y$	$-{\cdot}8919n$

* The star's R.A. evidently requires a correction of about $-1^s{\cdot}5$.

1880, *March* 17.—Disappearance of BAC 1518 at the dark limb:

		h m s	
G.M.T.	6 12 21·34		
Star's App. R.A.	4 48 58·75.	N.P.D. 65° 36′ 3″·5 (N.A.)	
Final Equation	$+5''{\cdot}92 =$	$+{\cdot}8870\,(e-x)$	$-{\cdot}3477t$
		$+{\cdot}2119f$	$+0{\cdot}2466m$
		$-{\cdot}2101y$	$-{\cdot}8879n$

1880, *March* 17.—Disappearance of WB_2 IV. 1193 at the dark limb:

	h m s	
G.M.T.	9 21 58·58	
Star's App. R.A.	4 54 18·43.	N.P.D. 65° 31′ 44″·6 (WB_2)
Final Equation	$+12''\cdot80 =$	$+\cdot8616\,(e-x) - \cdot3965t$
		$-\cdot3100f \quad +2\cdot3103m$
		$+\cdot3118y \quad -\cdot8880n$

1880, *March* 17.—Disappearance of DM+24°, 730 at the dark limb:

	h m s	
G.M.T.	9 46 43·89	
Star's App. R.A.	4 55 5·89.	N.P.D. 65° 41′ 14″·4 (D.M.)
Final Equation	$+20''\cdot36 =$	$+\cdot8728\,(e-x) - \cdot4375t$
		$+\cdot2727f \quad +1\cdot2746m$
		$-\cdot2709y \quad -\cdot8880n$

1880, *March* 17.—Disappearance of WB_2 IV. 1227 at the dark limb:

	h m s	
G.M.T.	10 13 7·79	
Star's App. R.A.	4 55 28·45.	N.P.D. 65° 51′ 26″·4 (WB_2)
Final Equation	$+0''\cdot55 =$	$+\cdot4403\,(e-x) - \cdot2594t$
		$+\cdot8746f \quad -0\cdot8815m$
		$-\cdot8742y \quad -\cdot8880n$

1880, *March* 17.—Disappearance of DM+24°, 738 at the dark limb:

	h m s	
G.M.T.	10 15 44·89	
Star's App. R.A.	4 56 2·90.	N.P.D. 65° 41′ 46″·5 (D.M.)
Final Equation	$+36''\cdot64 =$	$+\cdot8829\,(e-x) - \cdot4664t$
		$+\cdot2304f \quad +1\cdot4320m$
		$-\cdot2286y \quad -\cdot8880n$

1880, *March* 17.—Disappearance of 103 *Tauri* at the dark limb:

	h m s	
G.M.T.	12 30 21·91	
Star's App. R.A.	5 0 49·62.	N.P.D. 65° 53′ 36″·3 (N.A.)
Final Equation	$+5''\cdot68 =$	$+\cdot7248\,(e-x) - \cdot4583t$
		$+\cdot6018f \quad -0\cdot0073m$
		$-\cdot6006y \quad -\cdot8881n$

1880, *March* 21.—Disappearance of d^2 *Cancri* at the dark limb:

	h	m	s	
G.M.T.	7	16	25·69	
Star's App. R.A.	8	19	4·87.	N.P.D. 72° 33′ 42″·3 (N.A.)

Final Equation ... ... $+6''{\cdot}24 = +{\cdot}9294\,(e-x) - {\cdot}3153t - {\cdot}2128f - 0{\cdot}1605m + {\cdot}2142y - {\cdot}9127n$

1880, *April* 16.—Disappearance of WB_2 VII. 326 at the dark limb:

	h	m	s	
G.M.T.	8	52	23·73	
Star's App. R.A.	7	12	7·54.	N.P.D. 68° 49′ 5″·7 (WB_2)

Final Equation ... ... $+2''{\cdot}76 = +{\cdot}9290\,(e-x) - {\cdot}3947t - {\cdot}0139f + 1{\cdot}6032m - {\cdot}0157y - {\cdot}8944n$

1880, *April* 16.—Disappearance of BB. VI.+21°, 1575 at the dark limb:

	h	m	s	
G.M.T.	9	20	3·95	
Star's App. R.A.	7	12	54·25.	N.P.D. 68° 56′ 27″·2 (BB. VI.)

Final Equation ... ... $+3''{\cdot}89 = +{\cdot}9107\,(e-x) - {\cdot}4331t + {\cdot}2009f + 1{\cdot}2864m - {\cdot}1992y - {\cdot}8945n$

1880, *April* 16.—Disappearance of 56 *Geminorum* at the dark limb:

	h	m	s	
G.M.T.	10	42	59·47	
Star's App. R.A.	7	14	54·10.	N.P.D. 69° 19′ 53″·3 (N.A.)

Final Equation ... ... $+4''{\cdot}72 = +{\cdot}4055\,(e-x) - {\cdot}3403t + {\cdot}9003f - 1{\cdot}1371m - {\cdot}8999y - {\cdot}8949n$

Occultations observed at Forest Lodge, Maresfield.
By Captain W. Noble.

1885, *March* 27.—BAC 3529. The sky was slightly hazy, and the Star, which was not particularly well defined, did not go out sharply and suddenly, but rather faded out at the Moon's dark limb at $10^h\ 24^m\ 44^s{\cdot}5$ local mean time$=10^h\ 24^m\ 26^s{\cdot}7$ G.M.T. It was at some distance from the bright limb ere it was caught at reappearance.